## REMARKS

Favorable reconsideration of this application, in light of the following discussion, is respectfully requested.

Claims 1-17 are currently pending. No claims have been amended herewith.

In the outstanding Office Action, Claims 1-17 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

Claim 1 is directed to a process for reforming a quartz glass crucible, wherein the quartz glass crucible is reformed by an arc discharge generated by electrodes positioned around a rotational axis and configured to heat an inside surface of the crucible while the crucible is rotated, the process comprising: (1) arranging electrodes in an electrode structure in which neighboring electrodes are positioned at regular intervals from each other in a ring-like configuration; (2) determining a phase of an electric current based on a number and arrangement of the electrodes; (3) forming a stable ring-like arc between the neighboring electrodes, without generating a continuous arc between electrodes facing each other across a central portion of the ring-like configuration, by applying electric current of the determined phase to the electrodes; (4) heating the inside surface of the crucible while the crucible is rotated; and (5) removing one of a foreign substance located on the inside surface and a bubble located under the inside surface.

Applicants respectfully traverse the rejection of Claim 1 under 35 U.S.C. § 112, first paragraph. In this regard, Applicants respectfully submit that the step of determining a phase of an electric current based on a number and arrangement of the electrodes is adequately supported by the originally filed specification, as discussed in more detail below.

The Discussion of the Background section of the present application notes that "the conventional electrode structure forming the arc discharge is a structure having 3 electrodes with a 3-phase alternating current, in general, in which 3 electrodes are used, and the 3-phrase

alternating electric current flows to the 3 electrodes to form the arc (discharge) plasma between each of the electrodes. However, the structure has a fault in that the arc becomes unstable to be cut off when a distance between the electrodes is increased in order to expand the heating range."[1] Further, the Discussion of the Background section notes that:

> [t]herefore trials increasing the number of electrodes to expand the heating range have been carried out, and a structure having 6 electrodes with 6-phase alternating current has been proposed. However, for the structure having 6 electrodes with 6-phase current, as shown in Figure 6, it is easy to generate an arc discharge between electrodes facing each other, rather than between the electrodes neighboring each other, so there is a problem that the heat of discharge at the central portion encircled by the electrodes becomes excessively large...[2]

Thus, the specification points out the problems in the conventional systems in which three electrodes using three-phase alternating current, or six electrodes using six-phase alternating current are used.

Further, the present specification illustrates various combinations of electrode structures having a number of electrodes and a corresponding phase alternating current such that a stable ring-like arc between neighboring electrodes is formed without generating a continuous arc between electrodes facing each other across the central portion of the ring-like configuration. For example, see the six-electrode, three-phase alternating current structure of Figure 1; the nine-electrode, three-phase alternating current structure of Figure 2; the four-electrode, two-phase alternating current structure of Figure 3; and the eight-electrode, four-phase alternating current structure shown in Figure 4. As illustrated in these figures, one aspect of the present invention is determining the phase of an electric current that is to be used with an electrode structure having a particular arrangement and a number of electrodes. Compare, for example, Figures 1 and 6, both of which have six electrodes arranged in a ring-like structure. The conventional system of Figure 6 uses six-phase alternating current, while

[1] See paragraph [0006] of the published application. Emphasis added.
[2] See paragraph [0007] of the published application.

the arrangement of the present invention shown in Figure 1 uses six electrodes with three-phase alternating current. As discussed in the specification, the six-electrode, three-phase alternating current structure is able to form a stable ring-like arc between neighboring electrodes without generating a continuous arc between electrodes facing each other. Thus, the determination of the phase of the electric current to be applied to this configuration of six electrodes was recognized by the inventors as the difference between a stable ring-like arc and a non- stable ring-like arc. Further, as shown in Figures 2-4, based on the number of electrodes in the structure, an appropriate phase alternating current must be determined in order to create a stable ring-like arc.

Further, Applicants respectfully submit that the determining step recited in Claim 1 is supported by the discussion on pages 6 and 7 in the original specification. For example, the specification states that:

> [i]n the example shown in Figure 1, the six electrodes (E1 to E6) are used with the three-phase alternating electric current.... With three-phase alternating electric current, the phase difference between electrodes neighboring each other is 120°, and the electrodes facing each other across a central portion of the ring have the same phases. More particularly, each electrode is connected as follows. Electrode E4 facing the electrode E1 across the central portion of the ring has the same R phase when the electrode E1 has the R phase of the three-phase alternating electric current, and simultaneously, the electrodes E2 and E6 which are located on opposite sides of the electrode E1, have the T phase and the S phase, respectively, and the electrodes E3 and E5, which are located on the outer sides of electrodes E2 and E6, have the S phase and the T phase, respectively. Therefore, the electrodes E1 and E4, the electrodes E2 and E5, and the electrodes E3 and E6 have the same respective phases, although each pair has a different phase with respect to the other electrodes.[3]

Further, the specification notes that "...since electrodes E2 and E6, which are located on opposite sides of electrode E1, have different phases than the electrode E1, the stable arc can be formed between electrode E1 and E1's side neighbors. Therefore, the ring-like arc generated between electrodes neighboring each other can be formed along the inside surface

[3] See paragraph [0032] of the published application.

of the crucible. On the other hand, since electrodes E1 and E4, which face each other across the central portion of the ring, have the same phase, the arc crossing at the center portion of the ring cannot be formed, so that the central portion of the crucible cannot be heated excessively."[4]

Further, the specification notes that "[c]ommonly, in the electrode structure having 3n electrodes with 3-phase alternating current ($n \geq 4$), the ring-like arc generated between the electrodes neighboring each other can be formed according to the above description, and the stable arc crossing the central portion of the ring is not substantially formed."[5] The specification continues on pages 7 and 8 to describe the four electrode, two-phase alternating current and the eight electrode, four-phase alternating current examples. Page 8 of the specification also discusses why the conventional structure having six electrodes with six-phase alternating current is deficient. Further, the examples on pages 10-12 of the specification illustrate the importance of choosing and determining the appropriate electric current based on an arrangement and number of the electrodes.

For the reasons stated above, Applicants respectfully submit that one skilled in this art would clearly understand from reading Applicants' specification that the present inventors recognized that determining an appropriate phase of an electric current based on a number and arrangement of the electrodes was an integral aspect of their invention. In particular, the Applicants' comparison of the six-electrode structures shown in Figures 1 and 6, and the importance of determining the phase of the electric current illustrates the present inventor's understanding of this claimed limitation.

For the reasons stated above, Applicants respectfully traverse the rejection of Claim 1 under 35 U.S.C. § 112, first paragraph regarding the description requirement. Applicants

[4] See paragraph [0033] of the published application.
[5] See paragraph [0034] of the published application.

respectfully submit that the present specification provides adequate written description for the step of determining a phase of an electric current based on a number and arrangement of electrodes in an electrode structure, as recited in Claim 1.

Claim 13 recites the same determining limitation recited in Claim 1. Accordingly, for the reasons stated above regarding Claim 1, Applicants respectfully traverse the rejection of Claim 13 under 35 U.S.C. § 112, first paragraph.

Consequently, in light of the above discussion, the outstanding grounds for rejection are believed to have been overcome. The present application is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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